



PATENT
Docket No. DP-309304

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit: 2862
Examiner: Kenneth J. Whittington
Applicant: Robert James Byram
Serial No.: 10/673,589
Filing Date: September 29, 2003
Title: ROTARY POSITION SENSOR

DECLARATION UNDER 37 CFR §1.131

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Robert James Byram, do hereby declare and say that:

(1) I am the sole inventor of the subject matter covered by each of the claims pending in the above-identified U.S. patent application (the "Application").

(2) I was formerly employed as an engineer with Delphi Automotive Systems ("Delphi"), and during the course of my employment was engaged in research and development directed toward the designing and manufacturing of position sensors.

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(3) Claims of the Application are rejected under 35 USC §103(a) as being unpatentable over U.S. Patent Application Publication No. US 2004/0257067 A1 to Mattson et al. (the "Mattson application"), whose effective filing date is June 18, 2003, in view of U.S. Patent No. US 6,356,073 B1 to Hamaoka et al.

(4) This Declaration is being presented at this time for the purpose of overcoming the aforementioned 35 USC §103(a) rejection.


(5) Prior to June 18, 2003, I had conceived and completed, in this country, my disclosed and claimed invention for a rotary position sensor, as evidenced by the Delphi "Record of Invention" form, Docket No. DP-309304, a copy of which is attached hereto as Exhibit A. The Record of Invention states that "the subject device has the advantage of linearizing the output without the cost and complication of the inner pole shoes. This is accomplished by taking advantage of the non-uniform field in the magnets interior region. By placing the sensor excentric to the rotation of the magnetic field, it moves into a constantly increasing field density as it rotates." (Second page of Exhibit A.) The Record of Invention also states that "By taking advantage of the non uniform field strength and by making the sensing device excentric to the axis of rotation, a more linear output can be obtained." (Fourth page of exhibit A.) A drawing of a such rotary position sensor is shown as "Fig. 3" on the ninth page of Exhibit A.

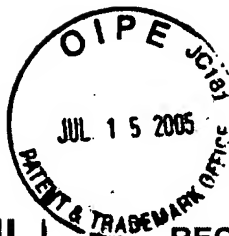
Applicant: Byram
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(6) Prior to June 18, 2003, I had reduced my invention to practice by producing a rotary position sensor according to the device described in the Application, as evidenced by the statement at 10. on the third page of Exhibit A, "Magnetics modeled, samples built and reduced to practice and tested (Fig. 4), production process conceived."

(7) The evidence presented herein is pertinent to the aforementioned 35 USC §103(a) rejection of the claims, in that the device disclosed in the Application and covered by the claims was conceived and reduced to practice in the U.S. by the sole inventor prior to the effective filing date of the Mattson application.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

 08 July 05
Robert James Byram Date



DELPHI
Automotive Systems
Just Talk

RECORD of INVENTION

Part 1

VAC
AIR CONTROL
MISC

Original

File No.:	DP309304
FAA	
Class	
For I.P. Office Use Only	

RECEIVED/DELPHI

REQUEST FOR
INTELLECTUAL PROPERTY INVESTIGATION

This provides for the disclosure of your invention with the minimum detail necessary for an initial evaluation by a Review Board consisting of engineering/business management & Legal Staff personnel. The Review Board will consider the novelty and competitive significance in determining the appropriate disposition of your invention. If the Review Board decides to pursue a patent, you will be required to complete a Record of Invention (Part 2) containing the detailed disclosure necessary to enable the preparation of a patent application. If the Review Board decides to publish your invention, you will be provided instructions for preparing a disclosure for publication.

Delphi-C Chassis	Delphi-E Energy & Engine Mgmt.	Delphi-H Harrison Thermal	Delphi-I Interior & Lighting	Delphi-P Packard Electric	Delphi-S Saginaw Steering	Delco Electronics
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Location: TCF

Product group this invention applies to:
(see divisional instructions for a list)

AIR MANAGEMENT AND CONTROLS

Invention

Title: ROTARY POSITION SENSOR WITH LINEAR OUTPUT

Please Print or Type; This form is also available in MS-Word as a template.

Inventor #1

Name: ROBERT BYRAM J BYRAM Citizen of: USA
First Name Middle Initial Last Name

Social Security No. 385440501 Delphi Employee: ☒ Yes ☐ No ☒ Salary ☐ Non-GM ☐ Hourly ☐ Other GM

Home Address: 1471 E. COOK RD. GRAND BLANC MI 48439 Home Telephone: 8106954093
Street/P.O. Box No. City and State Zip Code Area Code + Number

Delphi Address: 1601 N. AVERILL AVE FLINT MI 48556 Work Telephone: 8102578705
Street/P.O. Box No. City and State Zip Code Area Code + Number

Department Name/Number: 32-18 Mail Code: 485 220 060 Fax Number: 810 257 7737
Area Code + Number GM (8) Number

Immediate Manager: LISA MCMULLIN Mail Code: 485 220 060 Telephone: 810 257
Area Code + Number GM (8) No. or Area Code + No.

2nd Level Manager: SALLY MALE Mail Code: 485 220 060 Telephone: 810 257
Area Code + Number GM (8) No. or Area Code + No.

Non-Delphi Employer: _____ Telephone: _____
(if applicable) Area Code + Number

Non-Delphi Employer Address: _____
Street City and State Zip Code

Exhibit A

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Answer the following questions, completing all of them to the best of your knowledge.

1. Date this invention was or is expected to be disclosed (including to a supplier) outside GM: _____
2. Date this invention was used or is committed to be used in production: _____
3. Date this invention was offered for sale outside GM: _____
4. Was this invention made while working on a Government Contract? ☐ Yes ☒ No
If yes, identify the government Contract/Purchase Order No. _____
5. Identify the product or process in which the invention is incorporated:

LIMITED ANGLE ROTARY ACTUATORS FOR VARIOUS PURPOSES

6. Provide enough detail of the specific new features, components, or steps that form the invention to enable a general understanding of its technical content and novelty. The description should be referenced by numerals to an attached drawing, (if appropriate), that highlights the specific features, components, or steps of the invention including the environment or assembly in which the invention is incorporated.

THIS INVENTION RELATES TO A ROTARY POSITION SENSOR USING A PERMANENT MAGNET FIELD IN CONJUNCTION WITH A MAGNETIC SENSING ELEMENT SUCH AS A HALL DEVICE. KNOWN IN THE ART ARE DEVICES USING A RADIALLY ORIENTED RING MAGNET SUCH AS BONDED SM CO TO PRODUCE A FIELD IN ITS INTERIOR. (FIG 1) THIS FIELD MAY BE MEASURED WITH A HALL DEVICE OR OTHER SUITABLE SENSOR. BECAUSE THIS FIELD IS CONSTANT IN ANY GIVEN POSITION, THE OUTPUT WILL BE SINUSOIDAL AS A FUNCTION OF ANGLE. IT IS USUALLY ADVANTAGEOUS TO HAVE A LINEAR OUTPUT AS A FUNCTION OF ANGLE. ALSO KNOWN IN THE ART ARE SIMILAR DEVICES THAT USE INNER POLE SHOES TO CONCENTRATE AND LINEARIZE THE OUTPUT SUCH AS DESCRIBED IN THE REFERENCED MMT PATENT. (FIG 2) THE SUBJECT DEVICE HAS THE ADVANTAGE OF LINEARIZING THE OUTPUT WITHOUT THE COST AND COMPLICATION OF THE INNER POLE SHOES. THIS IS ACCOMPLISHED BY TAKING ADVANTAGE OF THE NON-UNIFORM FIELD IN THE MAGNETS INTERIOR REGION. BY PLACING THE SENSOR EXCENTRIC TO THE ROTATION OF THE MAGNETIC FIELD, IT MOVES INTO A CONSTANTLY INCREASING FIELD DENSITY AS IT ROTATES. THIS INCREASING FIELD DENSITY INCREASED THE OUTPUT THUS OFFSETTING THE SINUSOIDAL ROLL OFF THAT WOULD OCCUR IN A CONCENTRIC DEVICE. (FIG 3) FIGURE 4 SHOWS THE COMPARISON OF THE PRIOR ART USING A CONCENTRIC SENSOR TO THIS INVENTION UTILIZING AN EXCENTRIC SENSOR. THIS INVENTION IS NOT LIMITED TO SYMMETRICAL CIRCULAR MAGNETS BUT IS ALSO APPLICABLE TO RECTANGULAR (FIG 5) AND NON-SYMMETRIC MAGNETIC CIRCUITS (FIG 6) AS WELL.

DESCRIPTION FOR ALL DRAWINGS

- 1 PERMANENT MAGNET (S)
- 2 STEEL POLES -OUTER
- 3 STEEL POLES -INNER
- 4 MEASURING DEVICE (HALL, ASIC, MRD)
- 5 FIELD LINES

Exhibit A

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7. What are the competitive benefits to be realized through the use of this invention? For example: cost, quality and performance improvements, new features and products, etc.

LOWER COST, LINEAR OUTPUT PERFORMANCE

8. To the extent known, what alternatives exist for accomplishing substantially the same result as this invention?

USE INNER POLE SHOES TO CONCENTRATE AND LINEARIZE THE FLUX OUTPUT

9. What are the technical benefits obtained, problems solved, and advantages realized over the alternatives identified in Item #8?

LOWER COST DUE TO FEWER PARTS THAN PRIOR ART USING INNER POLE SHOES
LINEARIZED OUTPUT WHEN COMPAIRED TO PRIOR ART WITHOUT POLE SHOES

10. What is the state of development of this invention?

MAGNETICS MODELED, SAMPLES BUILT AND REDUCED TO PRACTICE AND TESTED(FIG 4).
PRODUCTION PROCESS CONCEPTED

Exhibit A

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RECORD of INVENTION

Part 2

Date _____
Received: _____
Delphi Contact _____
Person: _____
Attorney _____
Assigned: _____

For I/P Office Use Only

This Record of Invention (Part 2) provides for the disclosure of the information necessary to enable the preparation of a patent application for your invention and to enable compliance with the legal requirements for obtaining patent protection.

1. File number as identified in the Record of Invention (Part 1): _____
2. Date this invention was first thought of: _____
3. Please list all the individuals who can provide information relating to the making of the invention. This list may include individuals who made the first sketch, description, or tests and individuals who are familiar with the facts relating to the making of the invention.

JOHN KREUCHER, LISA MCMULLIN

4. Each inventor has a legal duty to disclose all information known that is material to patentability. Such information includes the relevant prior art, which may be in the form of current or past products, equipment, processes, materials, patents, publications, advertisements, displays, and unpublished developments and proposals--whether originated by you, others in GM, competitors, suppliers, customers or others. Such information also includes disclosure of this invention outside GM, sales and offers of products using this invention, use of this invention in production and disputes about who should be considered as an inventor of this invention. To comply with the duty to disclose, list here and attach a copy of all such information, to the extent known.

MMT PATIENT FOR CIRCULAR MAGNET WITH INTERNAL POLES

5. Describe the background of the invention. This description may include the state of the prior art and problems associated with the prior art that are overcome by this invention.

IT IS COMMON FOR ROTARY ACTUATORS TO REQUIRE A ROTARY POSITION SENSOR AS PART OF THEIR CONTROL SYSTEM. IT IS DESIREABLE TO HAVE THIS SENSOR OUTPUT LINEAR WITH ANGLE. PRIOR ART AS DESCRIBED IN THE MMT PATENT REQUIRES INTERNAL POLES TO OBTAIN A LINEAR OUTPUT. THIS ADDS COST AND ADDITIONAL ASSEMBLY CONCERNS. ASSEMBLIES WITHOUT POLE SHOES, WHICH ARE COMMON IN THE INDUSTRY, PRODUCE A NON LINEAR OUTPUT. THE PRESENT INVENTION SOLVES THIS PROBLEM BY PROVIDING A LINEAR OUTPUT WITHOUT THE INTERNAL POLE

6. Summarize what you consider to be the general underlying principles of this invention.

BY TAKING ADVANTAGE OF THE NON UNIFORM FIELD STRENGTH AND BY MAKING THE SENSING DEVICE EXCENTRIC TO THE AXIS OF ROTATION, A MORE LINEAR OUTPUT CAN BE OBTAINED.

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7. Attach a complete description of the invention. In order to meet legal requirements, the description must be of the best mode contemplated by the Inventor(s) of carrying out the invention at a level enabling one skilled in the art to make and use the invention. Following are guidelines for preparation of the description:

Mechanical Devices: Include a detailed description and drawings which illustrate all essential elements of the invention and the environment in which it is used. The description should describe the structure key-numbered to the drawing(s) and the operation of the structure including the functional relationship between all elements. To the extent known, alternate embodiments should be described.

Electrical Devices: The description for hardware-based electrical devices is the same as for Mechanical Devices.

Circuit-based Inventions: Include a detailed description and circuit diagrams reduced to standard components for parts of the circuit that are new. Standard components, such as amplifiers, microprocessors, logic gates, etc. can be represented as labeled blocks. The description should describe all of the blocks and components of the circuit and their interaction.

Computer program-based inventions: Include a detailed description, a schematic of the components monitored and/or controlled by the program, the physical structure (such as the computer memory) associated with the program, and a general functional flow chart of the program illustrating the steps of the program to carry out the invention at a level of detail from which one skilled in the art can understand and implement the program. The description should set forth the operation of the program, describing each element of the flow chart and its relationship or interaction with the components monitored and/or controlled by the program.

Chemical Inventions (materials and/or processes for making them or for using them to make other things): Identify all essential materials (in chemical terms-not tradenames) used and alternatives therefor. All significant variables needed to define the invention must be identified, quantified and discussed. Depending on the nature of the invention, such variables might include: treatment/reaction times, temperature, pressure, concentration, particle shape/size, viscosity, crystal structure, phases, porosity, pH, density, tensile strength, polymer chain length, etc. Each variable should be quantified in terms of an operative range and a preferred embodiment, e.g. "The heat treatment is carried out between 100°C and 200°C (preferably 165°C)." The function/purpose of each variable should be described including a statement as to what happens if the variable falls outside the operative range, e.g. "Component A serves as a plasticizer for Component B. Below 100°C, Component A will not mix with Component B, and above 200°C it evaporates". Finally, a recipe for at least one detailed working example should be provided. Preferably, several such examples will be provided covering the full range of the significant variables used to define the invention.

Processes: Include a schematic of the components monitored, controlled and/or created by the process and a flow chart of the process illustrating the steps of the process at a level of detail from which one skilled in the art can understand and implement the process. The description should set forth the operation of the process describing each step of the flow chart and its relationship or interaction with the components monitored, controlled and/or created by the process.

8. Provide any additional information that may help in understanding the invention or aid in the preparation of a patent application for your invention: (attach additional pages if necessary)

MMT PATIENT NO
APPLICATION NOTE BY MELEXIS.

X

Exhibit A

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Authorization

I hereby assign this invention to ~~General Motors~~ ^{DELPHI} ^{RB}
and authorize ~~General Motors~~ ^{DELPHI} ^{RB} Corporation to file a patent application on this invention.

Robert James Byram ^{RB}
INVENTOR - SIGNATURE (ALSO, TYPE or PRINT NAME) DATE

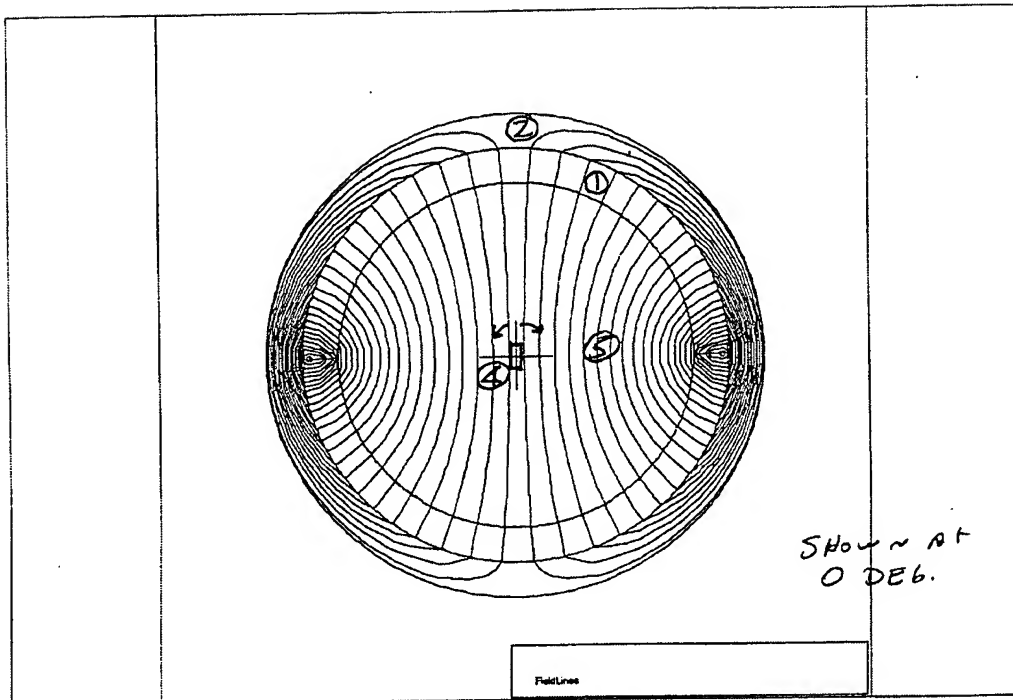
INVENTOR - SIGNATURE (ALSO, TYPE or PRINT NAME)

INVENTOR - SIGNATURE (ALSO, TYPE or PRINT NAME) DATE

This invention was reviewed, understood, and acknowledged by management to possess sufficient substance for review:		
<u>Lisa McMullin</u>	<u>LISA McMullin</u>	
MANAGER'S APPROVAL	(ALSO, TYPE or PRINT NAME)	DATE
1st WITNESS		
<u>John E. Kreucher</u>	<u>John E. Kreucher</u>	
2nd WITNESS - SIGNATURE	(ALSO, TYPE or PRINT NAME)	DATE

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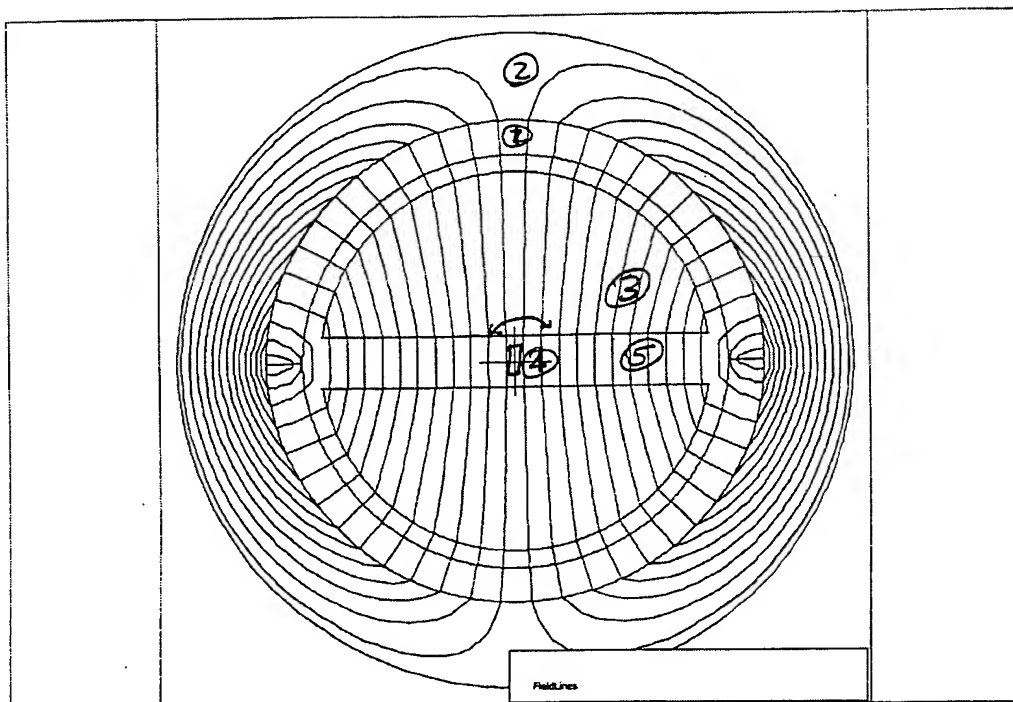
\vec{B} FIELD INSIDE "RING" MAGNET
WITH CONCENTRIC SENSOR

Exhibit A

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Fig 1

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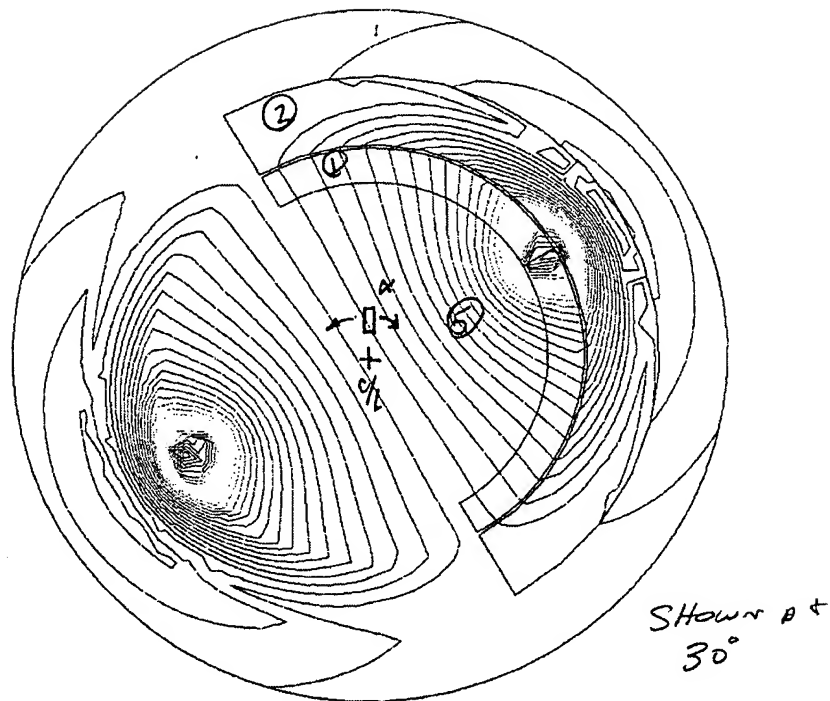


\vec{B} FIELD INSIDE "RING" MAGNET
with inner pole shoes

Exhibit A

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Fig 2



B FIELD INSIDE "RING" MAGNET
WITH EXCENTRIC SENSOR

Exhibit A

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Fig 3

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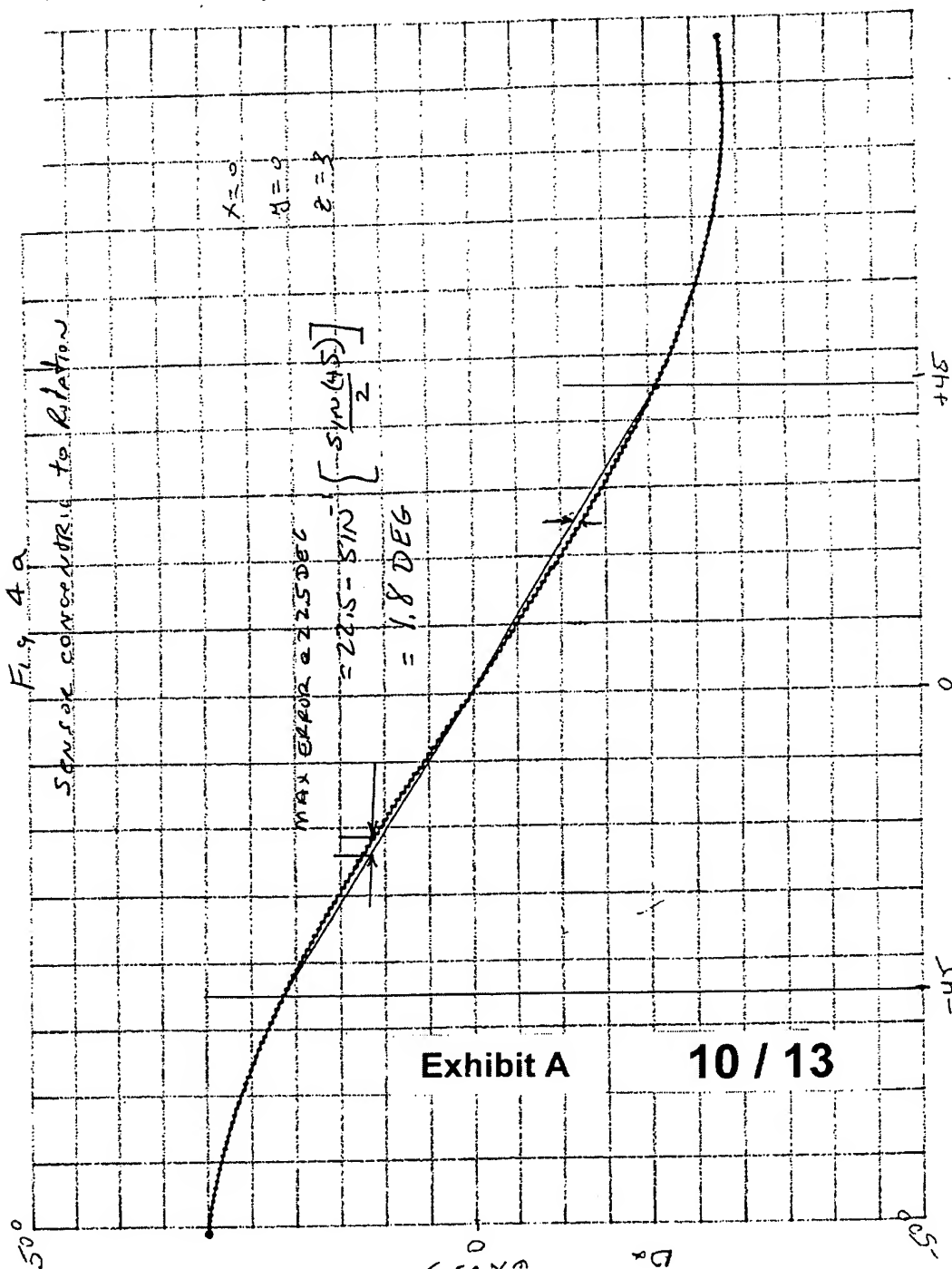


Exhibit A

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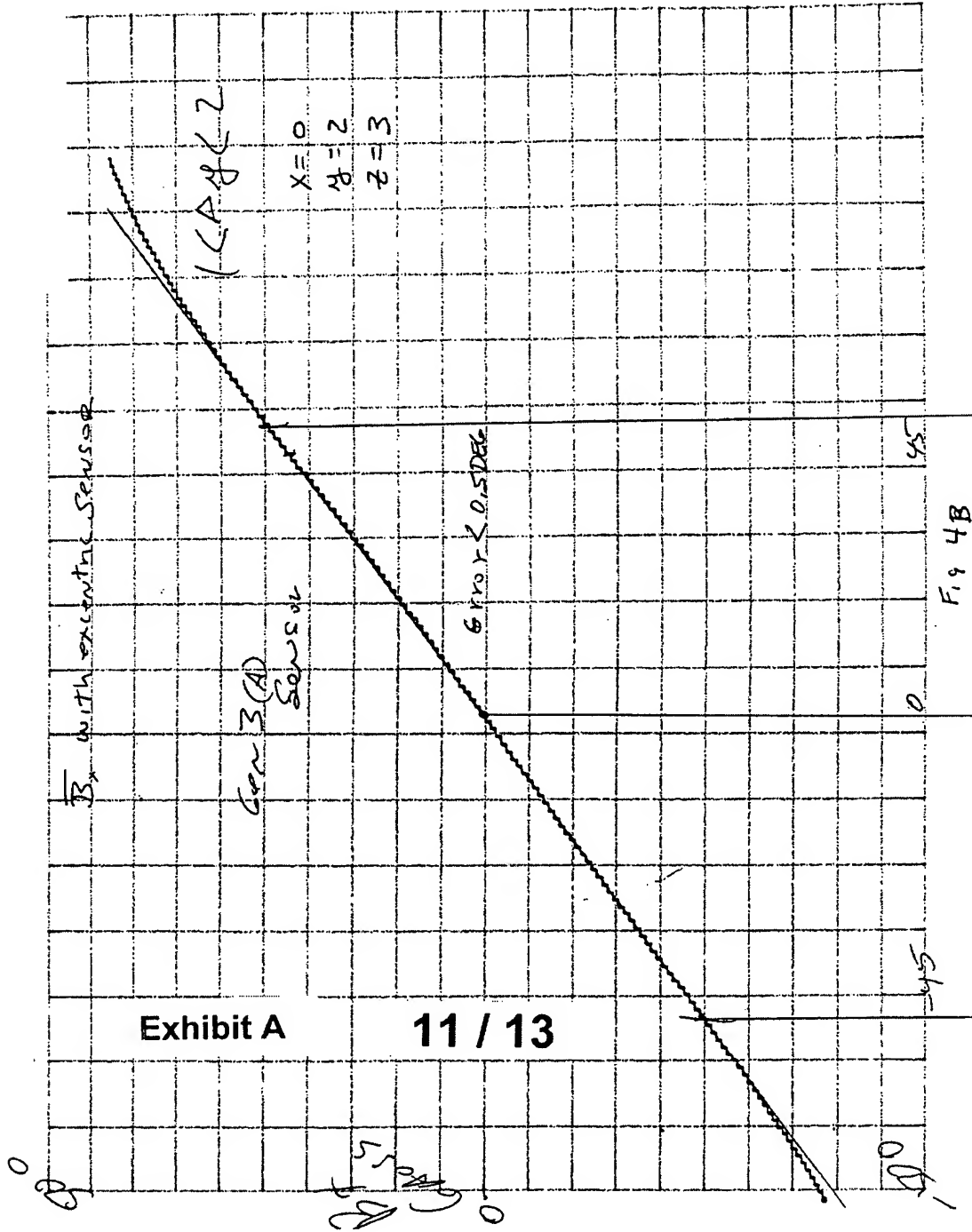
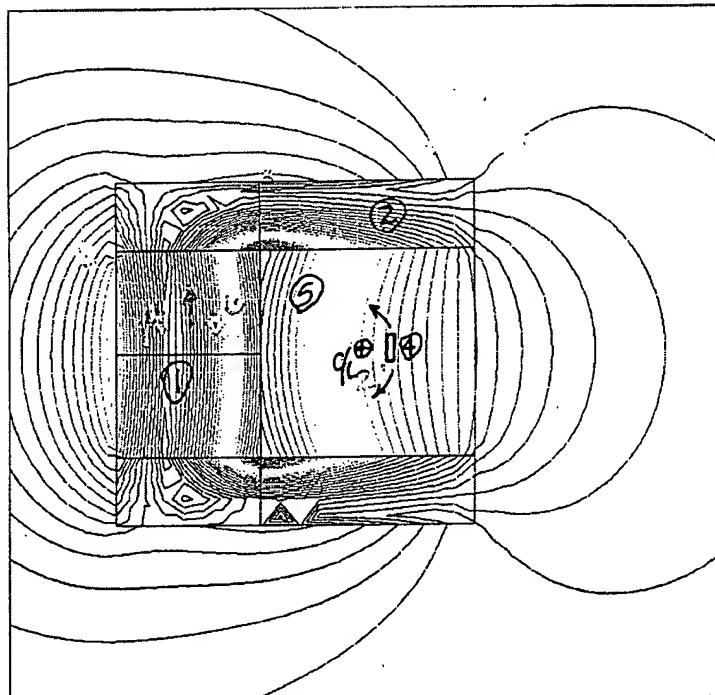


Exhibit A

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Fig 4B



B FIELD INSIDE "RECTANGULAR" MAGNET
CIRCUIT WITH EXCENTRIC SENSOR

Exhibit A

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F485

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